Structure of actin cross-linked with α-actinin: a network of bundles

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Filamentous (F)-actin networks are involved in muscle function, cell shape, motility, and division. The elucidation of structures formed from F-actin and associated biological molecules (like α-actinin) is a necessary step towards a fundamental understanding of the mechanical and rheological properties of cells.

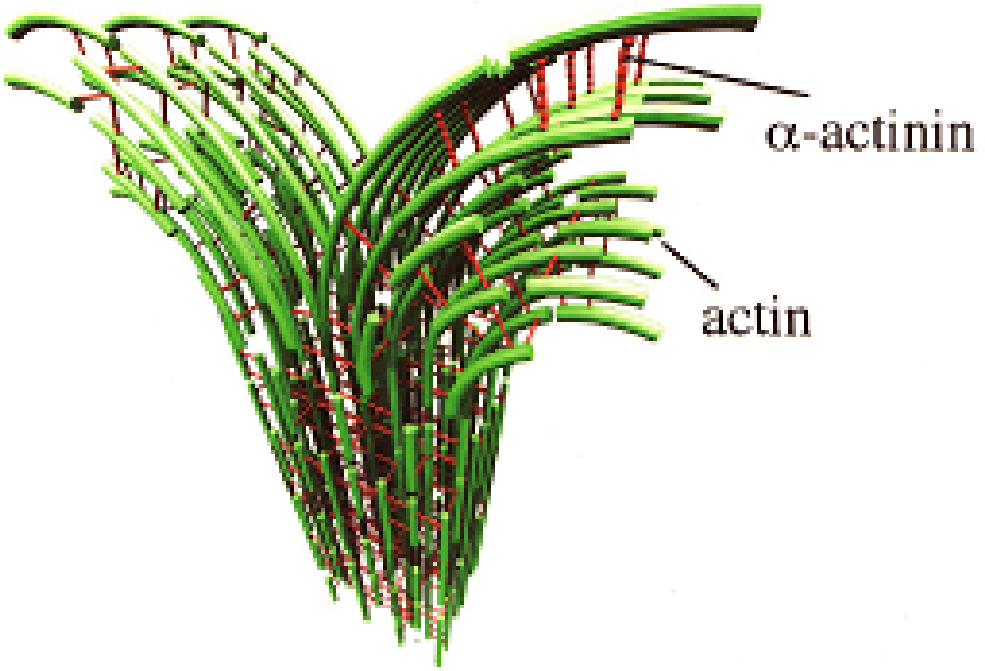

Illustration of a proposed structure of a F-actin bundle at a branching site, showing how the protein α-actinin (red) induces a network-like structure in the F-actin protein by forming cross links between its filaments. This structure revealing nanoscale ordering is based on a synchrotron x-ray scattering study which indicates that α-actinin forms a disordered distorted square lattice within the Bundle. (O. Pelletier et al., *Physical Review Letters*, 91(14) 148102 1-4, 2003).

Supramolecular Assembly of Biological Molecules

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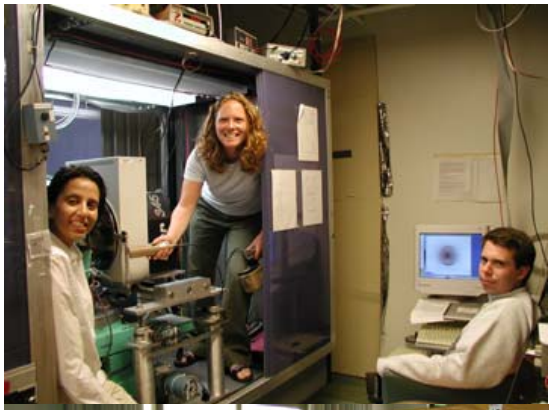

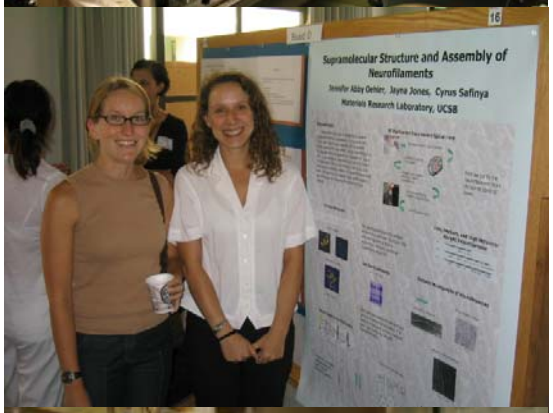

Education: The goals are to educate undergraduates, graduate students (top figure, Ayesha Ahmad (left), Heather Evans (middle), and Ryan Case), and postdoctoral researchers, in methods which enable them to discover nature's building blocks and rules for assembling the blocks in distinct shapes and sizes for particular functions. The learned concepts enable development of advanced nanoscale materials for broad applications in electronic, chemical, and pharmaceutical industries.

Outreach: Jennifer Abby Oehler, a sophomore at Allan Hancock Community College, and Santa Barbara High School teacher Danielle Aranda were Summer 2003 interns in the PIs group. Jennifer (Internships in Nanosystems Science and Engineering Technology (INSET) program) and Mentor Jayna Jones (graduate student) studied how neurofilaments build up the structures that impact mechanical strength and stabilize nerve cells (middle figure, Jennifer, right). Danielle participated in UCSB's RET program (Research Experience for Teachers) and with Mentor Linda Hirst (Postdoctoral researcher) studied how actin filaments which make up the skeleton of cells arrange themselves for cell functions such as sticking, crawling, and growing (cell division) (bottom figure, Danielle, right).